From: Tsiamis, Christos
To: Carr, Brian
Subject: FW: Ground water model report
Date: Tuesday, November 03, 2015 3:26:24 PM

FYI

From: Juliana.Hess@CH2M.com [mailto:Juliana.Hess@CH2M.com]
Sent: Monday, November 02, 2015 10:11 AM
To: Tsiamis, Christos <Tsiamis.Christos@epa.gov>
Cc: Jeff.Gentry@CH2M.com; Nate.Brown@CH2M.com
Subject: FW: Ground water model report

Hi Christos, below are the answers in blue from Nate and Jeff to the two questions you posed on the NYC groundwater modelling. Please let us know if you need anything additional on this. Thank you J

1. The info is complete in order to make an assessment about the influences of tank construction and cut-off wall (combined) on flooding in the area.

The information provided is not complete. Calibration of the model is discussed in only two sentences of the document, with no supporting calibration graphics, tables, or statistics. Information on the model, calibration process, and results is needed for a meaningful review of this work.

2. The assessment is correct or there is a different interpretation of the data.

One feature that was modeled incorrectly is the extent of the ISS zone. The document shows the modeled ISS zone as extending from the head of the Gowanus Canal between Butler Street and Douglass Street down to Carroll Street rather than stopping at the southern end of the Fulton site, near Union Street, which is where the southern extent of the ISS zone is depicted in the Feasibility Study. Shortening the ISS zone to what was described in the FS would to some degree result in less forecast mounding.

The graphical output provided illustrates model results in terms of forecast groundwater-level rise; however, it is difficult to assess the depth to groundwater implied by these forecasts. A more practical approach would be to show results in terms of the forecast depths to groundwater. That would allow a more direct assessment of flooding potential.

Of the three features modeled (i.e., ISS zone, barrier wall, and CSO tanks), their model indicates that upland groundwater levels would increase the most in response to installation of the barrier wall down to -50 feet. The effect of adding the tanks was then superimposed on the barrier wall and minimal additional mounding was indicated. This result seems reasonable; however, without more information on the actual numerical model used by the City or access to a defensible groundwater model with which to perform an independent analysis, it is not possible to confirm or refute the forecast magnitudes of groundwater-level rise or diversion fluxes around the barrier wall. In light of the remaining uncertainty, the forecast diverted groundwater flow around the barrier wall of 65

gallons per minute should not be viewed as a reliable number to design a water treatment capacity. However, it is a starting point for engineers to apply appropriate safety factors and discuss conceptual approaches for managing that diverted groundwater. The more robust hydraulic analysis to be performed during the design should be reviewed to assess whether the potential flux of impacted groundwater leaving the barrier wall and potential mounding is consistent with the selected remedy for the Canal.

The overall modeling work would benefit by using the information being developed by National Grid. For example, the City's modeling effort used two wells (their locations were not provided). There are two sets of nested wells near Fulton where groundwater levels are being monitored. These could provide additional calibration targets for the City's models. Also, hydraulic conductivity estimates for the City's model differ slightly from what National Grid is indicating. It would be beneficial for City staff to review the PD-7 data against their model inputs.

From: Tsiamis, Christos [mailto:Tsiamis.Christos@epa.gov]
Sent: Monday, October 26, 2015 4:02 PM
To: Hess, Juliana/NJO <Juliana.Hess@CH2M.com>
Subject: Ground water model report

Juliana,

Could you please have Nate review this (I might have already sent you the whole package of responses from NYC but I am pointing this out as of particular interest now.)

I need his comments as to whether

1. The info is complete in order to make an assessment about the influences of tank construction and cut-off wall (combined) on flooding in the area.

The information provided is not complete. Calibration of the model is discussed in only two sentences of the document, with no supporting calibration graphics, tables, or statistics. Having more information on the model, calibration process, and results would facilitate a more meaningful review of their work.

2. The assessment is correct or there is a different interpretation of the data.

One feature that was modeled incorrectly is the extent of the ISS zone. The document shows the modeled ISS zone as extending from the head of the Gowanus Canal between Butler Street and Douglass Street down to Carroll Street rather than stopping at the southern end of the Fulton site, near Union Street, which is where the southern extent of the ISS zone is depicted in the Feasibility study. Shortening the ISS zone would result in less forecast mounding to some degree.

The graphical output provided illustrates model results in terms of forecast groundwater-level rise; however, it is difficult to assess the depth to groundwater implied by these forecasts. A more

practical approach would be to show results in terms of the forecast depths to groundwater. That would allow a more direct assessment of flooding potential.

Of the three features modeled (i.e., ISS zone, barrier wall, and CSO tanks), their model indicates that upland groundwater levels would increase the most in response to installation of the barrier wall down to -50 feet. The effect of adding the tanks was then superimposed on the barrier wall and minimal additional mounding was indicated. This result seems reasonable; however, without more information on the actual numerical model used by the City or access to a defensible groundwater model with which to perform an independent analysis, it is not possible to confirm or refute the forecast magnitudes of groundwater-level rise or diversion fluxes around the barrier wall. In light of the remaining uncertainty, the forecast diverted groundwater flow around the barrier wall of 65 gallons per minute should not be viewed as a reliable number to design a water treatment capacity. However, it is a starting point for engineers to apply appropriate safety factors and discuss conceptual approaches for managing that diverted groundwater. The more robust hydraulic analysis to be performed during the design should be reviewed to assess whether the potential flux of impacted groundwater leaving the barrier wall and potential mounding is consistent with the selected remedy for the Canal.

The overall modeling work would benefit by using the information being developed by National Grid. For example, the City modeling effort used two wells where the location was not defined. There are two sets of nested wells near Fulton where water levels are being monitored. These could provide additional calibration targets for the Cities models. Also, hydraulic conductivity estimates for the City's model differ slightly from what national Grid is providing. The data in PD-7 results would be beneficial to the city to review their model inputs.

Thank you,

Christos